

BACKGROUND OF THE INVENTION

Field of Invention

5 The present invention pertains to the field of document authentication. More particularly, this invention relates to document authentication using the physical characteristics of the underlying physical media of the document.

10 Art Background

A wide variety of documents including event tickets, paper currency, stock certificates, securities, checks, and other legal documents, etc., are commonly subject to various types of forgery. For example, such documents may be copied using color copiers. In another example, ink may be stripped off of the paper which underlies an authentic document and a new image printed on the paper, thereby enabling conversion of a low face value document to a high face value document.

In some prior methods of document authentication, a water-mark and/or other object is inserted into the paper on which a document is printed. Such methods attempt to avoid forgeries by making it difficult to reproduce the characteristics of the paper which underlies a document. Unfortunately, such methods usually cannot prevent the stripping of ink from the original paper and the printing of a new image.

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SUMMARY OF THE INVENTION

5 A method for authenticating a document is disclosed in which a document key for the document is generated by examining one or more attributes of a physical media that underlies the document. An original image is then imparted onto the physical media so that the original image is associated with the document key in a way that enables a subsequent
10 recovery of the document key from the original image. This tying together of the underlying physical media, through the document key, with an original image enables detection of a forgery which was performed either through an alteration of the original image,
15 or ink stripping and re-printing, or a printing of the original image on another physical media.

20 Other features and advantages of the present invention will be apparent from the detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

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according to the present techniques;

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when generating a document key.

DETAILED DESCRIPTION

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30. Otherwise, the document is not verified as authentic at step 32.

5 The private key secures the image to the
underlying paper. This may be used to generate
checks for originality. An authorized copy may be
created where a new original/copy may be produced
using the public key to decode the document key of
the original. The watermark may then be removed and
10 then a new watermark re-encoded using the new
document key which is signed with the private key.

15 **Figure 4** shows one possible arrangement for
generating a document key 52 for a document 40. This
arrangement may be employed when authenticating the
document 40 at step 10 and/or when verifying the
document 40 at step 20. The document 40 is fed into
an imager 42. The imager 42 generates a set of pixel
values on an output 50. The pixel values on the
20 output 50 are provided to a document key generator 44
which in response generates the document key 52 for
the document 40.

25 The pixel resolution of the imager 42 is
selected to enable detection of the unique physical
attributes of the underlying paper of the document 40
upon which the document key 52 is based. In one
embodiment, the imager 42 provides a pixel resolution
of 2400 dots per inch which enables detection of the
30 random differences in the density of the paper fibers
that were formed during the manufacture of the paper
that underlies the document 40.

In some embodiments, the document key generator 44 examines the pixel values in one or more predetermined areas of the document 40. There may be any number of these predetermined areas. The
5 predetermined areas may be of any size and may be located anywhere on the document 40.

Figure 5 shows one possible arrangement of predetermined areas 60-62 of the document 40 which
10 are examined by the document key generator 44. In this embodiment, the predetermined areas 60-62 are referenced by distances from an edge 70 and an edge 72 of the document 40. For example, corresponding edges of the predetermined area 60 are a distance d2
15 and a distance d1 from the edges 70 and 72, respectively. Similarly, corresponding edges of the predetermined area 62 are a distance d4 and the distance d1 from the edges 70 and 72, respectively.

20 In some embodiments, a box may be used to delineate the area to be scanned. The box may be given orientation features (for example, directionality) to aid the reader in extracting the document key. Multiple boxes may be used for
25 additional security and tolerance to document damage.

The document key generator 44 may use any encoding method for generating the document key 52. For example, the document key generator 44 may
30 generate a checksum of the pixel values in each of the predetermined areas 60-62 and then determine an average of the checksums to yield the document key 52. As another example, the document key generator

5 In some embodiments, the document key 52 for the document 40 may be recorded in, for example, a data base along with information that describes what is originally printed on the document 40. Thereafter, the document 40 may be authenticated by obtaining its document key and performing a data base lookup using the document key to obtain the information that describes what was originally printed on the document 40. If something else is printed on the document 40 then it can be concluded that the original printing was stripped and replaced by a forger.

The foregoing detailed description of the present invention is provided for the purposes of illustration and is not intended to be exhaustive or to limit the invention to the precise embodiment disclosed. Accordingly, the scope of the present invention is defined by the appended claims.